Weighing the snow core to determine the water content

FEDERAL-STATE COOPERATIVE SNOW SURVEYS AND IRRIGATION WATER FORECASTS

for

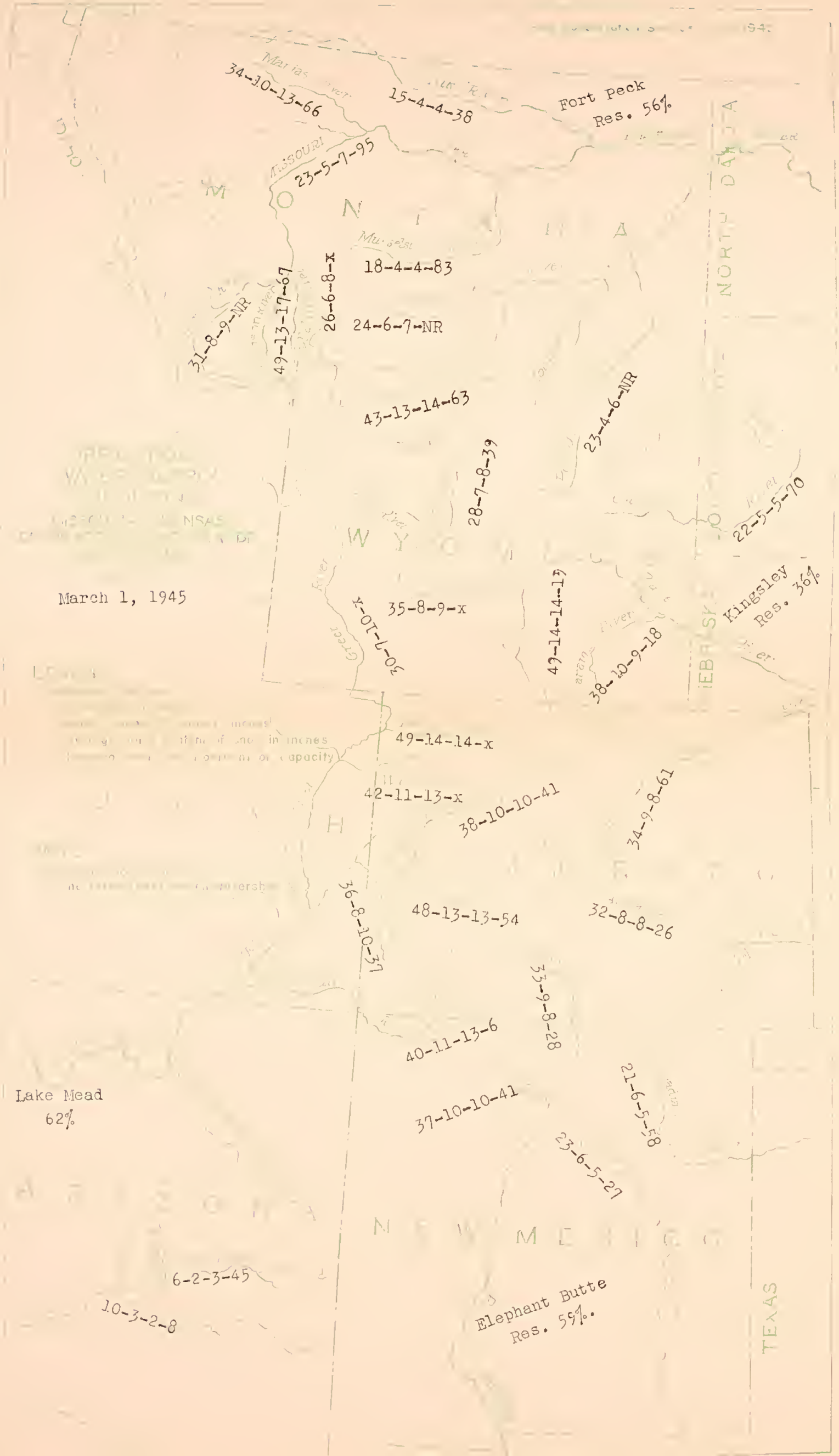
MISSOURI and ARKANSAS DRAINAGE BASINS

MARCH 1,1945

By

Division of Irrigation, Soil Conservation Service
United States Department of Agriculture
and
Colorado Agricultural Experiment Station

Data included in this report were obtained by the agencies named above in cooperation with the U. S. Forest Service, National Park Service, State Engineers of Colorado, Wyoming and New Mexico and other Federal, State and local organizations.


March 1, 1945
34-10-13-66
15-4-4-38
Fort Peck
Res. 56%
23-5-7-95
18-4-4-83
26-6-8-x
31-8-9-NR
49-13-17-67
24-6-7-NR
43-13-14-63
23-4-6-NR
28-7-8-39
22-5-5-70
35-8-9-x
50-7-10-x
49-14-14-19
38-10-9-18
Kingsley
Res. 36%
49-14-14-x
42-11-13-x
38-10-10-41
34-9-8-61
36-8-10-37
48-13-13-54
32-8-8-26
33-9-8-28
40-11-13-6
21-6-5-58
37-10-10-41
23-6-5-27
Lake Mead
62%
6-2-3-45
10-3-2-8
Elephant Butte
Res. 59%.

March 1, 1945

WATER SUPPLY OUTLOOK

MISSOURI-ARKANSAS DRAINAGE BASINS

For the Missouri River and its tributaries the irrigation water supply outlook is quite favorable at this time except in Montana. The prospects are especially good on the North and South Platte drainages in Colorado and Wyoming. In the Black Hills area also, conditions are very favorable for a normal water supply. Because of the unusual amount of water in the reservoirs on the Arkansas River and normal snow cover in the mountains, the irrigation water supply for this area is practically assured.

MISSOURI RIVER AND TRIBUTARIES IN MONTANA

JEFFERSON: On the headwaters of this stream the present average water content of the snow is 8.4 inches, which is about 10 percent less than normal. Last year the snow-water storage, at this time, was 5.5 inches. During the past month the amount of water in the snow increased about 5½ inches over this watershed. The water supply outlook has improved and at this time a normal run-off may be expected.

MADISON: The average water content of the snow on this drainage is now 13.2 inches or about 75 percent of normal and 30 percent above last year's measurements. During February there was an increase in the water content of about 5½ inches which very materially improved the water supply outlook for this drainage. The storage in Hebgen Reservoir is now 217,700 acre-feet or about 65 percent of capacity. Unless normal snowfall occurs during the remainder of this winter it is doubtful if the run-off will be sufficient to meet the irrigation needs this coming season.

GALLATIN: The present average water content of the snow on this drainage is slightly below that of a year ago and only 75 percent of normal. The present indications are that the run-off in this stream will be somewhat below normal this season.

MARIAS: The water supply outlook for the coming season's irrigation needs in the valley is much better than it was a month ago but the indications at this time are that the seasonal flow of this stream will be below normal. At present the water content of the snow cover is 9.6 inches which is about 3 inches more than it was a month ago. The 8-year average is 12.8 inches.

MISSOURI: (Between Helena and Great Falls) For this drainage the average water content of the snow is now 5 inches which is 75 percent of normal but about one inch more than it was a year ago at this time. The snow-water storage was increased last month by about 2 inches. The season's run-off

in this and its several tributaries, will probably not reach normal flow. The present snow cover throughout this whole drainage appears to be only three-quarters of the normal for this time of year and unless above normal spring storms occur, the water supply for the upper Missouri, and side streams, will be deficient in meeting the irrigating needs in this section of Montana.

YELLOWSTONE: The water prospects for this stream are somewhat better than a month ago and it is likely that the run-off this season may approach normal. At present this average water content of the snow is 5.8 inches which is one inch more than it was a year ago and one inch less than normal. On the Lewis Lake Divide snow course, in Yellowstone Park, the snow averaged 7½ feet in depth and contained 26 inches of water on March first. This water content is quite close to that of past years for this date, except for 1943, when the snow-water content was 55.4 inches.

MILK RIVER: The water content of the snow on this drainage approximates that of a year ago and is now normal. Storage in the Fresno and Nelson reservoirs totals 79,300 acre-feet. During February the accumulation was less than 500 acre-feet. The general outlook is now favorable and it is expected that no water shortage will occur during the coming irrigation season.

SHOSHONE RIVER: The water content of the snow on the headwaters of this stream increased from 8.2 inches to 12.6 during February and is now only 1 inch short of the 10-year average. Storage in the Shoshone reservoir decreased about 18,000 acre-feet during the past month and now stands at 288,000. The potential water in snow storage over the drainage area above this reservoir is substantial and during the spring run-off will bring the reservoir to full capacity. Over the Shoshone Project in the vicinity of Powell, Wyoming, the soil moisture is fair and stream flow seasonable. Range conditions are also fair. At the lower elevations of this drainage area the present snow cover is light. The general water supply outlook for the coming irrigation season is encouraging and at this time no water shortage is expected in this section of the state.

BIG HORN RIVER: On the Big Horn and tributaries, above Worland, the water content of the snow averages 7.0 inches. On the first of February it was 4.0, and last year at this time it was 5.6. The 10-year average is about 8 inches. The outlook is generally good at this time for an adequate irrigation supply for the coming irrigation season. For the farming areas the soil moisture is fair to good and range conditions are very satisfactory. Storage in Bull Lake and Pilot Butte reservoirs now totals about 72,000 acre-feet as compared with 102,000 a year ago. Because of the near normal snow cover at this time it is expected that these reservoirs will fill to near capacity and the small reservoirs near Wind River will be filled before the start of the irrigation season.

CHEYENNE RIVER: There has been an increase in the water content of the snow cover in the Black Hills during last month, rising from 3.1 inches to 4.7. The present snow-water storage is practically the same as it was last year at this time. In the farming districts the general soil moisture conditions are good to excellent and with moderate weather the run-off in the streams will be much increased because of the good snow cover at lower elevations. The storage the Belle Fourche reservoir is now 123,700 acre-feet as compared with 102,600

a year ago. There is little doubt as to the filling of this reservoir to capacity before the start of the irrigation season. The outlook is very good for an adequate irrigation supply as based on snow cover throughout this region and the favorable soil moisture, which will be sufficient to carry the crops without irrigation well into the late spring and summer.

NORTH PLATTE RIVER: A marked improvement in the snow conditions on this stream and its tributaries has resulted from the several storms over the mountain country of this drainage during the past month. The average water content of the snow increased from 8.0 inches to 13.7 during February and is now practically normal for this time of the year. March first last year the water content was 8.9 inches. The total storage in the principal reservoirs on the North Platte in Wyoming is now 436,400 acre-feet, a gain of about 30,000 during February. Last year at this time the total was 558,000. In Lake Minatare, Pathfinder Irrigation District in western Nebraska, the present storage is 19,300 acre-feet as compared with 11,500 a year ago. In the lower valley, in Nebraska, the Kingsley reservoir has 728,000 acre-feet in storage and the Sutherland 52,000. Last year these reservoirs stored 671,000 and 49,500 acre-feet, respectively. Throughout the valley the water now held in storage for the coming season is substantial and assures an adequate irrigation supply for 1945. Soil moisture is good to excellent in all the irrigated areas of the valley. Run-off is more or less normal in the upper reaches of the valley and slightly below in the lower country. From the State Line east to the vicinity of Scottsbluff the area is snow covered to a depth of 4 to 6 inches. The water prospects for 1945 are very encouraging due to the fine increase in snow cover, good soil moisture, and the steady accumulation in reservoir storage.

SWEETWATER RIVER: The snow cover over this drainage was improved during February by an increase in the water content from 3.9 inches to 7.8, practically the same as it was a year ago. It is expected that the run-off in this stream will approach normal this coming summer and will provide additional storage in the North Platte reservoirs in Wyoming.

LARAMIE RIVER: The outlook for the irrigation water supply from the Laramie River is much improved since February first. At present the average water content of the snow over the headwaters of this stream is 9.7 inches as compared with 5.6 a year ago and is now one inch above normal. The snow-water storage during February increased 4.1 inches. At Brooklyn Lake the snow pack contains 16 inches of water and on Deadman Hill there is about 11 inches in snow storage. The lower elevations and range areas are now snow covered and will contribute to the run-off later during the melting season. Because of the snow blanket, widespread over the whole Laramie River valley, the soil moisture will be greatly improved to a favorable condition at planting time. Run-off at this time is slightly below normal. Reservoir filling is increasing. There was a gain of about 2,500 acre-feet in the Wheatland reservoirs during February for use on lands in the lower valley. It is to be expected that the irrigation water supply for the coming season will be good as indicated by the present favorable snow cover over the whole drainage area.

SOUTH PLATTE RIVER BASIN

CACHE LA POUDRE: Over the past month the average water content of the snow on the headwaters of this stream and its tributaries increased by just 5 inches to a total of 10.5 which is more than 1 inch above normal. On March 1st, last year, the average water content was only 5.7 inches. On Cameron and Milner Passes the snow-water storage is approximately 16 inches at this time and on the headwaters of the Pine it is nearly 11. For the first time in the past several years has the snow cover at elevations of about 8,500 feet been as much as it is at present. This snow at the lower elevations will increase this run-off earlier this year. For the Poudre valley the soil moisture conditions are only fair due to deficient precipitation last fall but the reservoir storage is increasing. During February the gain was approximately 3,700 acre-feet to a total, March 1st of 27,700. Last year at this time it was 45,600. The outlook for the coming irrigation season is now very favorable and because of the potential water in snow storage, on the headwaters of this stream, there is little doubt as to the filling of the irrigation reservoirs to full capacity.

BIG THOMPSON: The average water content of the snow on this drainage is now 12.1 inches which is more than twice what it was a year ago. During last month the accumulation was 6.7 inches and at present the water content equals the past 10-year average. In the lower valley of the Big Thompson the reservoir storage is 33,400 acre-feet, last year at this time it was 34,200. About 1,000 acre-feet were stored during February. The soil moisture throughout the farming area is good, also crop and range conditions. The over-all prospects for the coming season's irrigation water supply is very good and because of mountain snow pack now above normal, there is no fear as to an ample water supply for 1945. Most all of the storage reservoirs will fill to capacity.

ST. VRAIN: During February the water content of the snow on the Wild Basin course increased from 5.2 inches to 9.5 which is about one inch above normal. The present amount of water in snow storage is just twice as much as it was a year ago at this time. The general soil moisture conditions throughout the valley are fairly good, however, stream flow appears to be somewhat below normal. Reservoir storage is increasing. Because of the above normal snow cover in the mountains it is expected that the coming spring run-off will be ample to fill all storage reservoirs to near capacity. The water supply outlook at this time is especially good for the season of 1945.

BOULDER CREEK: The outlook for this drainage is especially good at this time for an ample irrigation water supply. There was an average accumulation of 4.5 inches in the water content of the snow on the headwaters of the Boulder Creeks during February which brought the total to 10.2. Last year at this time it was 3.6, the 10-year average being 7.8 inches. Throughout the farming area of the valleys the soil moisture is fair to good and streamflow is about normal. Reservoir storage is

improving and now closely approximates that of last year at this time. The above average water content of the snow cover on the headwaters of these streams indicates sufficient run-off later to practically fill the reservoirs to full capacity.

CLEAR CREEK: There has been an average increase in the snow-water storage on the headwaters of this stream of 5 inches during February bringing the total to 10.5 which is just slightly below the 10-year average. At this time in 1944 the average water content was 6.4 inches. In the lower valley, in the vicinity of Denver, the reservoirs now hold about 15 percent more water than a year ago. Soil moisture is fairly good and stream flow normal. The irrigation water supply prospects for the coming season appear to be very good at this time and there is little doubt as to the ultimate filling of the reservoirs.

CROW CREEK: This tributary to the South Platte may be expected to have a better run-off than last year as based on snow cover on the headwaters. At present the water content of the snow is 4.5 inches as measured on Pole Mountain in Wyoming and is the most for this time of year since 1939. Last year the water content was 3.0 inches. Most of the run-off will be consumed for irrigation and domestic supply for the city of Cheyenne and little will eventually get to the South Platte in Colorado.

SOUTH PLATTE: The prospects for run-off from the upper South Platte have improved since February first. At present the average water content of the snow is 3.3 inches as compared with 2.4 last year at this time. The 10-year average is 4.0 inches. The reservoirs supplied by water from this stream, above Denver and in the vicinity now store about 195,000 acre-feet, while last year at this time the total was about 202,000. The spring run-off will be sufficient to bring the reservoir filling to practically full capacity before the start of the irrigation season. The soil moisture is generally quite satisfactory throughout the upper valley of the South Platte.

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For the South Platte drainage as a whole, the outlook for the water supply this season, is at this time very satisfactory and because of the substantial increase in the snow-water storage on the headwaters of the several tributaries the spring run-off will be sufficient to meet the immediate irrigation demands as well as provide enough extra water to fill all the principal reservoirs to capacity. At this time the storage in the lower South Platte River valley is 70 percent of full capacity and because of the dependable return flow to the river the filling of these lower-valley reservoirs is very material during the winter months of the year. It is quite probable that the spring run-off will start earlier this season because of the better snow cover at lower elevations.

ARKANSAS RIVER: During the past month the average water content of the snow on the headwaters of this stream increased from 4.7 inches to 7.7 and is nearly two inches more now than it was a year ago at this time but still slightly less than the past 10-year average. The outlook for the coming season's water supply, from the snow melt, has improved since the first of February and the indications now are very favorable. The storage in both plain and mountain reservoirs is now exceptionally good and the near-normal snow cover on the drainage gives assurance of a possible record filling at the beginning of the irrigation season. The present filling, of near 330,000 acre-feet, is very substantial in comparison with about 160,000 at this time last year. The general conditions throughout the valley as to soil moisture, stream flow and crop conditions are very favorable. There now appears little doubt as to the coming season's water supply for the Arkansas Valley. For the Purgatoire, the water content of the snow on the Whiskey Creek course, north fork of this stream, near Monument Lake, west of Trinidad, increased 2.6 inches during February to a total of 5.7 on March 1st. The past 8-year average is 3.6 inches. The Model reservoir now has 4,000 acre-feet in storage. Last year at this time it was 3,600. General soil moisture and crop conditions in the vicinity of Trinidad are now quite satisfactory.

SNOW SURVEYS AND IRRIGATION WATER FORECASTS
FOR MISSOURI AND ARKANSAS RIVERS
March 1, 1945

PRECIPITATION DATA

WATERSHED	STATE	Precipitation October 1 to February 28	Departure from Normal	Precipitation February	Departure from Normal
		Inches	Inches	Inches	Inches
Missouri	East. Mont.	1.73	-1.17	0.27	-0.18
Missouri	Cent. Mont	2.30	-1.40	0.48	-0.12
Missouri	North Wyo.	6.45	-0.40	1.53	+0.23
North Platte	Wyoming	4.57	+0.32	1.35	+0.44
South Platte	Colorado	3.99	-1.22	1.15	-0.40
Arkansas	Colorado	4.15	-0.88	1.14	-0.37

Precipitation for the period from October 1 to February 28 over the watersheds of the Missouri River in Colorado, Wyoming and Montana, and the Arkansas River in Colorado, has been considerably below normal except over the North Platte drainage in Wyoming where a slight excess of precipitation has been accumulated. February precipitation over the area was slightly below normal, except over the watershed of the North Platte.

SUMMARY OF MARCH 1 SNOW SURVEYS AND COMPARISON OF DATA WITH THAT OF PREVIOUS YEARS BY WATERSHEDS

WATERSHEDS	Snow Depth			Water Content			Number Courses in Average	Snow Density			1945 Water Content in percent of	
	Ten year Avg.*	1944	1945	Ten year Avg.*	1944	1945		Ten year Avg.*	1944	1945	Ten year Avg.*	1944
	In.	In.	In.	In.	In.	In.		Percent	Percent	Percent		
MISSOURI RIVER												
Jefferson River	35.4	26.6	31.3	9.4	5.5	8.4	5	27	21	27	89	153
Madison River	56.4	43.2	49.2	17.1	10.2	13.2	6	30	24	27	77	129
Gallatin River	31.2	27.7	26.0	7.9	6.6	6.0	7	25	24	23	76	91
Musselshell River	17.1	8.5	17.6	3.6	1.5	3.6	2	21	18	20	100	240
Missouri River**	27.5	20.7	23.2	6.6	4.3	5.0	11	24	21	22	76	116
Marias River	42.5	27.2	34.0	12.8	7.2	9.6	1	30	27	28	75	133
Yellowstone River	26.8	21.3	23.5	6.8	4.8	5.8	5	25	23	25	85	121
Milk River	17.1	19.3	15.0	4.4	5.0	4.5	1	26	26	30	102	90
Shoshone River	49.0	38.6	42.9	14.0	8.8	12.6	2	29	23	29	90	143
Bighorn River	29.8	24.9	28.1	7.7	5.6	7.0	7	26	22	25	91	125
Powder River	28.2	24.9	22.6	5.9	4.6	4.1	1	21	18	18	70	89
North Platte River	48.6	37.8	48.7	14.0	8.9	13.7	10	29	24	28	98	154
Sweetwater River	35.1	33.5	35.0	8.8	7.0	7.8	2	25	21	22	89	111
Laramie River	32.7	24.2	37.6	8.7	5.6	9.7	8	27	23	26	111	173
Cheyenne River	22.8	23.6	22.0	5.1	5.4	4.7	3	22	23	21	92	87
South Platte River***	18.5	14.1	17.4	4.0	2.4	3.3	3	22	17	19	82	137
Crow Creek	16.5	16.2	21.9	3.6	3.0	4.5	1	22	19	20	125	150
Poudre River	34.2	23.9	38.0	9.4	5.7	10.5	5	28	24	28	112	184
Big Thompson River	43.4	31.3	44.4	12.4	5.6	12.1	2	29	18	27	98	216
St. Vrain River	35.2	22.5	39.6	8.7	4.8	9.5	1	25	21	24	109	198
Boulder Creek	26.0	17.8	36.8	7.8	3.6	10.2	2	30	20	28	131	284
Clear Creek	40.2	26.4	40.2	10.8	6.4	10.5	2	27	24	26	97	164
ARKANSAS RIVER	32.8	25.0	31.7	8.2	5.9	7.7	9	25	24	24	94	130

*Some for shorter periods. **Between Helena and Great Falls ***Above Denver, Colo.

MISSOURI AND ARKANSAS RIVER WATERSHEDS

Summary of Federal and State Cooperative Snow Surveys

Issued March 10, 1945, at Fort Collins, Colo.

No.	Main Drainage and Snow Course	Local Drainage	Location: State	Location: Locality	Location: Description	Elev.	National Forest	Mar. 1 Snow Cover Measurements: Av. Snow Depth: Av.©	Av. Snow Depth: 1944	Av. Snow Depth: 1945	Av. Water Content: Av.©	Av. Water Content: 1944	Av. Water Content: 1945
								In.	In.	In.	In.	In.	In.
	JEFFERSON RIVER												
6	Camp Creek*	Red Rock Cr.	Idaho	6mi.N.Spencer	21-13N-36E	6800	Targhee	31.9	24.9	30.0	7.6	4.8	8.1
7	Moose Creek*	N.Fk.BigHole	"	3mi.S.Gibbons P	27-27N-21E	6200	Salmon	42.3	29.6	40.5	11.6	6.1	10.9
10	Gibbons Pass	N.Fk.BigHole	Mont.	Gibbons Pass	4-2S-19W	7100	Bitterroot	56.6	43.0	49.3	17.3	10.2	15.6
30	Pipestone Pass	Pipestone Cr.	"	Pipestone Pass	11-1N-7W	7200	DeerLodge	18.1	15.5	13.7	3.5	2.8	2.6
	Elkhorn Hot Spgs.	Wise River	"	8mi.N.Polaris	15-4S-12W	8450	Beaverhead	28.2	20.1	23.0	6.8	3.8	4.9
	Picnic Grounds	Bison Cr.	"	1mi.E.Elk Park	22-5N-6W	-	DeerLodge	--	--	9.8	--	--	1.4
					Average for Drainage			35.4	26.6	31.3	9.4	5.5	8.4
	MADISON RIVER												
2	Aster Creek*	Firehole R.	Wyo.	Lewis Lake	44.3N110.6W	7700	Yel.Nat.P.	67.8	44.8#	62.8	22.1	11.6#	16.4
8	Lewis L. Divide*	" "	"	3mi.S.Lewis L.	44.2N110.7W	7900	" " "	92.5	64.4#	90.1	30.0	16.2#	26.0
11	Norris Basin	Gibbon River	"	Norris Basin	44.3N110.7W	7500	" " "		26.4			6.6	
3	Big Springs*	South Fork	Idaho	Big Springs	34-14N-44E	6500	Targhee	57.3	47.9	49.0	16.8	12.0	13.3
16	West Yellowstone	South Fork	Mont.	W.Yellowstone	34-13S-5E	6700	Gallatin	35.9	28.2	28.0	9.9	6.1	6.7
	Twenty-one mile*	Greyling Cr.	"	8mi.S.Gallatin	1-11S-5E	7150	Yel.Nat.P.	45.4	40.4	34.0	12.8	9.1	8.6
	Hebgen Dam	Cabin Creek	"	Hebgen Dam	22-11S-3E	6550	Gallatin	39.8	33.4	31.0	11.1	6.5	7.9
					Average for Drainage			56.4	43.2	49.2	17.1	10.2	13.2
	GALLATIN RIVER												
	Devil's Slide	Hyalite Cr.	Mont.	20mi.S.Bozeman	14-5S-6E	8100	Gallatin	49.1	40.2	42.0	13.5	10.8	10.9
	Hood Meadow Extn.	" "	"	14mi." "	22-4S-6E	6600	"	26.2	24.1	21.0	6.0	5.9	4.2
	Mystic Lake No.1	Bozeman Cr.	"	12mi.SE. "	31-3S-7E	6600	"	23.6	21.7	22.6	5.9	4.9	5.1
	Mystic Lake No.2	" "	"	" " "	31-3S-7E	6600	"	21.5	21.1	17.0	5.0	4.7	3.3
	Twenty-one Mile	Gallatin River	"	8mi.S.Gallatin	1-11S-5E	7150	Yel.Nat.P.	45.4	40.4	34.0	12.8	9.1	8.6
	Ross Peak	Ross Cr.	"	12mi.N.Bozeman	10-1N-6E	7000	Gallatin	24.8	18.7	20.3	5.9	3.7	4.5
	New World Trail	Gallatin River	"	8mi.SE.Bozeman	13-3S-6E	7000	"	27.5	27.8	25.2	6.4	7.2	5.5
					Average for Drainage			31.2	27.7	26.0	7.9	6.6	6.0
	MUSSELSHELL RIVER												
	Grasshopper*	Musselshell R.	Mont.	6mi.S.W.S.Spgs.	19-9N-8E	7000	Lewis&Clark	17.0	8.9	16.1	3.6	1.4	3.5
	Orville Harris	Musselshell R.	"	12mi.E.W.S.Spgs.	31-10N-9E	6500	" "	17.2	8.1	19.1	3.6	1.6	3.8
					Average for Drainage			17.1	8.5	17.6	3.6	1.5	3.6

*Adjacent Drainage

©Average for period of record

#Readings February 15.

MISSOURI AND ARKANSAS RIVER WATERSHEDS

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	MISSOURI RIVER**							In.	In.	In.	In.	In.	In.
6	Chessman Res.	Tenmile	Mont.	11mi.SW.Helena	2-8N-6W	6200	Helena	15.4	11.3	7.0	3.8	1.9	1.1
11	Goat Mountain	South Fork	"	26mi.W.Gilman	47.5N112.9W	7000	Lewis&Clark	27.2	16.2	21.0	6.7	2.9	4.6
36	Stemple Pass	Canyon Creek	"	Stemple Pass	16-13N-7W	6900	Helena	31.7	25.4	28.0	7.3	3.0	6.8
41	Tenmile Cr.Lower	Tenmile	"	17mi.SW.Helena	13-8N-6W	6250	"	22.5	15.8	18.0	4.9	3.4	3.4
42	Tenmile Cr.Middle	"	"	" " "	13-8N-6W	6800	"	31.8	23.1	29.0	7.3	5.1	5.6
43	Tenmile Cr.Upper	"	"	" " "	19-8N-5W	8000	"	36.3	28.0	31.0	9.4	6.9	7.4
	Grasshopper	Grasshopper Cr.	"	6mi.S.W.S.Spgs	19-9N-8E	7000	Lewis&Clark	17.0	8.9	16.1	3.6	1.4	3.5
	King's Hill	Belt Creek	"	21mi.N.W.S. "	35-13N-7E	7950	" "	40.0	33.1	34.0	9.8	7.2	8.8
	Orville Harris*	Eight Mile Cr.	"	12mi.E.W.S. "	31-10N-9E	6500	" "	17.2	8.1	19.1	3.6	1.6	3.8
	Half Moon	Judith River	"	19mi.S.Lewiston	22-12N-18E	6000	" "	23.9	20.7	17.7	6.4	4.5	3.7
	Crystal Lake	Flatwillow Cr.	"	18mi.SE. "	24-12N-17E	5500	" "	39.4	37.6	34.5	9.8	9.3	6.3
					Average for Drainage			27.5	20.7	23.2	6.6	4.3	5.0
	MARIAS RIVER												
7	Desert Mountain*	Cutbank Cr.	Mont.	4mi.S.Belton	24-31N-19W	5600	FlatHead		--			--	
20	Marias Pass	Two Medicine	"	Summit	48.3N113.4W	5250	Glacier NP	42.5	27.2	34.0	12.8	7.2	9.6
					Average for Drainage			42.5	27.2	34.0	12.8	7.2	9.6
	YELLOWSTONE RIVER												
14	Dome Lake	Goose Creek	Wyo.	Dome Lake	11-53N-87W	8800	Big Horn		26.0	--		6.2	--
40	Lupine Creek	Lupine Creek	"	11mi.SEGardiner	44.9N110.6W	7300	Yel.Nat.P.	---	--	19.4	--	--	3.9
41	Blacktail Deer Cr.	Blk.Tail Deer	"	11mi. " "	44.9N110.6W	7500	" " "		--			--	
	Camp Senia	W.Br. Rock Cr.	Mont.	10mi.W.Red Ldg.	2-8S-18E	7870	Custer		22.6			5.8	
3	Canyon	Tower Creek	Wyo.	8mi.N.Canyon Jct	44.7N110.5W	7750	Yel.Nat.P.		31.2			5.8	
	Cooke City	Soda Bottle Cr.	Mont.	Cooke City	25-9S-14E	7400	Absaroka		14.3			2.1	
	Crevice Mtn.#1	Yellowstone	"	6mi.E.Gardiner	26-9S-9E	8400	Yel.Nat.P.	31.5	26.0	27.8	7.3	4.7	5.9
	Crevice Mtn.#2	"	"	7mi." "	26-9S-9E	8300	" " "	30.8	26.0	27.9	7.4	4.8	6.2
7	Lake Camp	"	Wyo.	3mi.NE.Fish.Br.	44.6N110.4W	7850	" " "		31.3			6.1	
	Porcupine	Porcupine Cr.	Mont.	12mi.NE.Wilsal	110-4N-10E	6500	Absaroka	15.6	9.4	13.6	3.5	1.8	2.8
	Hell's Canyon	Boulder Cr.	"	26mi.SE.Livingstn	23-5S-12E	6000	"	11.1	7.2	10.1	3.2	2.9	4.2
	Independence	" "	"	26mi.NE.Gardiner	22-7S-12E	8000	"	45.1	37.7	38.3	12.4	9.7	9.7
					Average for Drainage			26.8	21.3	23.5	6.8	4.8	5.8
	MILK RIVER												
	Rocky Boy	Milk River	Mont.	Bear Paw Mt.	15-28N-16E	---	OffForest	17.1	19.3	15.0	4.4	5.0	4.5

*Adjacent Drainage @Average for period of record **Between Helena and Great Falls

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	SHOSHONE RIVER							In.	In.	In.	In.	In.	In.
32	Sylvan Pass	Middle Creek	Wyo.	Sylvan Pass	12-52N-110W	7100	Yel.Nat.P	46.0	32.4	37.1	12.9	6.6	10.1
50	Brooks Lake #3*	Shoshone R.	"	Brooks Lake	23-44N-110W	9200	Washakie	52.0	44.9	48.7	15.1	10.9	15.1
					Average for drainage			49.0	38.6	42.9	14.0	8.8	12.6
	BIGHORN RIVER												
14	Dome Lake*	Shell Cr.	Wyo.	Dome Lake	11-53N-87W	8800	Bighorn		26.0	--		6.2	--
45	Sawmill Glade	Popo Agie R.	"	13mi.SW.Lander	3-31N-101W	8500	Washakie	20.9	27.0	19.8	4.4	5.0	4.6
46	Blue Ridge	" " "	"	15mi. " "	23-31N-101W	9500	"	28.7	31.1	26.4	7.1	7.6	5.8
47	South Pass	L.Popo Agie R.	"	19mi. " "	13-30N-101W	9000	"	34.5	31.9	34.2	8.7	6.8	7.6
49	Sheridan Cr.R.S.#2	Sheridan Cr.	"	16mi.NW.Dubois	3-42N-109W	7500	"	21.9	13.2	23.2	5.0	2.8	5.7
50	Brooks Lake #3	Wind River	"	Brooks Lake	23-44N-110W	9200	"	52.0	44.9	48.7	15.1	10.9	15.1
51	St.Lawrence R.S.	St.Lawrence Cr.	"	27mi.NW.Lander	26-1N-4W	9000	Shos.I.R.		21.0	--		3.4	--
52	Mosquito Park R.S.	Trout Creek	"	18mi. " "	23-2S-3W	9500	" " "		29.2	--		6.1	--
53	DuNoir	Wind River	"	9mi.NW.Dubois	27-42N-108W	8750	Washakie	29.4	15.8	26.2	7.6	3.8	6.5
54	T-Cross Ranch	Horse Creek	"	12mi.N.Dubois	1-43N-107W	8000	"	21.1	10.5	18.0	5.7	2.0	3.5
					Average for Drainage			29.8	24.9	28.1	7.7	5.6	7.0
	POWDER RIVER												
30	Red Fork	Middle Fork	"	23mi.W.Kaycee	18-43N-85W	7500	OffForest	28.2	24.9	22.6	5.9	4.6	4.1
	NO.PLATTE RIVER												
1	Cameron Pass	Michigan Cr.	Colo.	Cameron Pass	2-6N-76W	10300	Rooseyelt	48.1	38.4	49.2	15.2	11.8	15.2
7	Park View	Illinois Cr.	"	7mi.SE.Rand	24-5N-78W	9200	Routt	30.3	24.6	30.1	7.2	4.7	6.4
8	Columbine Lodge	Grizzly Cr.	"	Rbt. Ears Pass	21-5N-82W	9300	"	60.8	40.9	60.1	17.4	9.5	17.6
62	Willow Cr.Pass	Illinois Cr.	"	Willow Cr.Pass	1-4N-78W	9500	Arapaho	35.8	29.0	36.3	8.9	5.9	9.3
7	Bottle Creek	Encmpmnt Cr.	Wyo.	7mi.SW.Encmpmnt	24-14N-85W	8200	MedicineBow	36.6	28.2	38.8	10.0	6.3	10.8
8	Webber Spring	" "	"	10mi.W. "	27-14N-85W	9000	" "	45.5	37.6	48.8	12.7	9.3	13.8
9	Old Battle	" "	"	12mi.W. "	29-14N-85W	9800	" "	75.0	64.8	73.9	23.6	17.9	21.2
37	North French Cr.	N.French Cr.	"	Cent/Saratoga	27-16N-80W	10200	" "	69.9	48.6	70.8	22.6	12.2	22.4
38	N.Barret Cr.#2	Barrett Cr.	"	" "	30-16N-80W	9400	" "	51.6	39.5	48.2	14.4	7.7	12.9
39	Ryan Park #2	" "	"	" "	34-16N-81W	8400	" "	32.6	26.0	30.8	8.4	3.9	7.6
					Average for Drainage			48.6	37.8	48.7	14.0	8.9	13.7
	SWEETWATER RIVER												
29	Grannier Meadows	Rock Creek	Wyo.	20mi.SW.Lander	19-30N-100W	9000	Washakie	35.6	35.1	35.8	8.8	7.1	8.0
47	South Pass*	" "	"	19 " " "	13-30N-101W	9000	"	34.5	31.9	34.2	8.7	6.8	7.6
					Average for Drainage			35.1	33.5	35.0	8.8	7.0	7.8

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	LARAMIE RIVER							In.	In.	In.	In.	In.	In.
3	Brooklyn Lake	Nash Fork	Wyo.	7mi.NW.Cntennl	11-16N-79W	10200	Medicine Bow	49.6	38.3	52.3	16.1	10.4	16.2
11	Fox Park	Fox Creek	"	Fox Park	21-13N-78W	9200	" "	27.1	18.5	33.0	7.0	4.4	9.0
34	Pole Mountain #2*	Soldier Cr.	"	10mi.SE.Laramie	35-15N-72W	8700	" "	16.5	16.2	21.9	3.6	3.0	4.5
35	Libby Lodge #2	Libby Creek	"	3mi.NW.Cntennl	29-16N-78W	8700	" "	25.9	16.3	32.4	6.6	3.8	7.9
36	Hairpin Turn #2	Nash Fork	"	5mi.NW.Cntennl	24-16N-79W	9500	" "	27.7	17.0	32.6	7.5	3.9	8.5
4	W.Port.G.P.Tunnel	Laramie R.	Colo.	4mi.N.ChambersL.	7-8N-75W	8600	Roosevelt	26.0	18.6	29.8	6.6	3.6	7.4
50	Deadman Hill*	Deadman Cr.	"	10mi.W.R.Feather	26-10N-75W	10200	"	38.3	30.0	42.1	9.7	6.8	10.7
88	Roach	LaGarde Cr.	"	8mi.NW.Glendevey	5-10N-77W	9800	"	50.2	38.9	56.4	12.5	8.7	13.4
					Average for Drainage			32.7	24.2	37.6	8.7	5.6	9.7
	CHEYENNE RIVER												
1	Upper Spearfish	Spearfish Cr.	S.Dak.	21mi.SW.Spearfish	21-3N-1E	6500	Blk Hills	26.2	25.5	27.0	6.2	6.0	6.3
2	Upper Castle	Castle Cr.	" "	11mi.NW.Deerfld	24-2N-1E	6800	" "	25.6	26.9	24.3	5.3	5.9	4.7
3	Deerfield	Silver Cr.	" "	3mi.NW.Deerfield	23-1N-2E	6010	" "	16.5	18.4	14.6	3.7	4.2	3.2
					Average for Drainage			22.8	23.6	22.0	5.1	5.4	4.7
	SOUTH PLATTE RIVER												
14	Hoosier Pass	S.Platte R.	Colo.	Hoosier Pass	13-8S-78W	11400	Pike	30.9	21.6	24.5	7.2	3.9	5.2
15	Fairplay	" " "	"	Fairplay	33-9S-77W	10000	"	3.4	0.0	5.0	0.4	0.0	0.5
83	Jefferson Cr.#2	Jefferson Cr.	"	5mi.NW.Jefferson	14-7S-76W	10100	"	21.2	20.6	22.6	4.5	3.2	4.2
					Average for Drainage			18.5	14.1	17.4	4.0	2.4	3.3
	CROW CREEK												
34	Pole Mountain #2	Crow Creek	Wyo.	10mi.SE.Laramie	35-15N-72W	8700	Medicine Bow	16.5	16.2	21.9	3.6	3.0	4.5
	POUDRE RIVER												
1	Cameron Pass	JoeWright Cr.	Colo.	Cameron Pass	2-6N-76W	10300	Roosevelt	48.1	38.4	49.2	15.2	11.8	15.2
2	Chambers Lake	Poudre River	"	Chambers Lake	6-7N-75W	9000	"	20.9	8.0	30.9	5.2	2.3	7.5
3	Big South	" "	"	2mi.E.Chambers L	33-8N-75W	8600	"	9.2	2.9	15.1	1.8	0.7	3.4
50	Deadman Hill	N.Poudre R.	"	10mi.W.R.Feather	26-10N-75W	10200	"	38.3	30.0	42.1	9.7	6.8	10.7
65	Lake Irene*	Big S.Poudre	"	1mi.SW.Milner P.	8-5N-75W	10600	Ry.Mtn.NP	54.7	40.4	52.8	15.3	6.8	15.8
68	Hour Glass Lake	L.S.Poudre	"	2mi.NW.Pingree P	18-7N-73W	9500	Roosevelt		13.9	--		1.7	--
					Average for Drainage			34.2	23.9	38.0	9.4	5.7	10.5

*On adjacent drainage @Average for period of record.

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								In.	In.	In.	In.	In.	In.
	BIG THOMPSON												
65	Lake Irene*	BigThompson R.	Colo.	1mi.SW.Milner P.	8-5N-75W	10600	Ry.Mtn.N.P	54.7	40.4	52.8	15.3	6.8	15.8
95	Hidden Valley #2	Hidden Valley Cr.	"	9mi.W.Estes P.	23-5N-74W	9550	" " " "	32.2	22.2	36.0	7.6	4.4	8.4
					Average for Drainage			43.4	31.3	44.4	12.4	5.6	12.1
	ST.VRAIN RIVER												
41	Wild Basin	N.St.Vrain R.	Colo.	5mi.W.Allen's P.	24-3N-74W	10000	Ry.Mtn.N.P.	35.2	22.5	39.6	8.7	4.8	9.5
	BOULDER CREEK												
5	E.Port.Moffat T.	S.Boulder Cr.	Colo.	East Portal	2-2S-74W	9400	Roosevelt	10.8	6.7	19.1	2.7	1.2	4.5
60	UniversityCamp #2	N.Boulder Cr.	"	5mi.SW.Ward	28-1N-73W	10300	"	41.1	29.0	54.4	12.9	6.1	16.0
					Average for Drainage			26.0	17.8	36.8	7.8	3.6	10.2
	CLEAR CREEK												
61	Loveland Pass #2	Clear Creek	Colo.	10mi.W.Georgetown	27-4S-76W	10100	Arapaho	37.2	24.2	38.1	9.3	5.3	10.2
97	Grizzly Peak*	" "	"	1mi.W.Loveland P	2-5S-76W	11250	"	43.2	28.7	42.4	12.4	7.4	10.8
					Average for Drainage			40.2	26.4	40.2	10.8	6.4	10.5
	ARKANSAS RIVER												
19	Tennessee Pass	Tennessee Cr.	Colo.	Tennessee Pass	21-8S-80W	10200	Cochetopa	31.2	20.5	25.9	7.3	4.1	5.8
21	Twin Lakes Tun.	Lake Creek	"	9mi.W.TwinLakes	22-11S-82W	10500	"	29.4	21.3	24.9	8.1	5.4	7.1
42	Marshall Creek*	Poncha Creek	"	Marshall Pass	24-48N-6E	10800	"	40.5	31.8	38.5	10.1	6.9	10.6
43	Poncha Creek	" "	"	" "	19-48N-7E	10500	"	31.0	23.5	32.9	8.4	6.1	9.7
72	Whiskey Creek #2	Whiskey Cr.	"	Whiskey Cr.P.	37.2N105.2W	10300	MaxwellGrant	23.5	19.1	29.4	6.1	5.2	5.7
74	LaVeta Pass #2*	Cuchara Cr.	"	LaVeta Pass	22-28S-70W	9300	SanCristoGr	30.8	27.8	33.7	7.1	6.8	9.0
78	Four Mile Park #2	Lake Creek	"	3mi.SW.Twin L.	23-11S-81W	9700	Cochetopa	11.3	8.1	8.8	2.8	2.0	1.6
79	Fremont Pass #2	E.Fork Ark.R.	"	Fremont Pass	2-8S-79W	11400	Arapaho	46.9	31.0	40.0	11.6	7.4	8.6
92	Monarch Pass	S.Fork Ark.R.	"	Monarch "	16-49N-6E	10500	Cochetopa	50.7	42.2	51.3	12.7	8.8	11.3
99	Torres	S.Fork Purg.R.	"	1mi.W.Torres	22-34S-69W	--	MaxwellGrant	--	--	1.8	--	--	0.3
					Average for Drainage			32.8	25.0	31.7	8.2	5.9	7.7

*Adjacent Drainage
@Average for period of record

The following organizations cooperate in the snow surveys and irrigation water supply forecasts for the Colorado, Missouri-Arkansas and Rio Grande watersheds by furnishing funds or services.

STATE
- Colorado State Engineer
- Wyoming State Engineer
- Utah State Engineer
- New Mexico State Engineer
- Montana State Engineer
- Nebraska State Engineer
- Colorado Experiment Station
- Colorado Extension Service
- Montana Experiment Station
- Utah Experiment Station

FEDERAL
- Department of Agriculture
  - Forest Service
  - Soil Conservation Service
- Department of Interior
  - Bureau of Reclamation
  - Indian Service
  - Geological Survey
  - National Park Service
- Department of Commerce
  - Weather Bureau
- War Department
  - Army Engineer Corps

PUBLIC UTILITIES
- Colorado Public Service Company
- Western Colorado Power Company
- Denver and Rio Grande Western R.R. Company

MUNICIPALITIES
- City of Denver
- City of Boulder

WATER USERS ORGANIZATIONS
- Poudre Valley Water Users' Association
- Arkansas Valley Ditch Association
- Colorado River Water Conservation District

IRRIGATION PROJECTS
- Farmers Reservoir and Irrigation Company
- San Luis Valley Irrigation District
- Santa Maria Reservoir Company
- Costilla Land Company
- Uncompahgre Valley Water Users' Association
- Wyoming Development Company
- Goshen Irrigation District
- Kendrick Project
- Pathfinder Irrigation District
- Salt River Valley Water Users' Association
- San Carlos Irrigation and Drainage District

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